unpublished and even in part speculative material. As, in addition, the book was edited and published in the astonishingly short time of about ten months, it is remarkably up-to-date in all subjects covered, and in some chapters even adds much to previously published results.

The contents of this book strikingly illustrate that low temperature physics really is, as Gorter puts it, "a transverse section" through virtually every field of modern physics. Unfortunately this is the reason for an unavoidable shortcoming of the volume: the exclusion of several topics about which reviews have recently appeared in similar compendia covering other fields. Pippard's article on "Metallic Conduction at High Frequencies and Low Temperatures", and Van den Handel's on "Paramagnetism" in the latest volume of *Advances in Electronics and Electron Physics* are cases in point. Even more unfortunate are some omissions in the present volume not filled by previous publications. It is much to be hoped that a second volume of *Progress in Low Temperature Physics* will appear very soon, and that this will include review articles on important but presently slighted topics such as the theory of superconductivity, low temperature transport phenomena, especially the various oscillatory effects, and the ever troublesome problem of the temperature scale. However, carping on what *is not* in the book must not be allowed to detract from the high praise due authors, editor, and publishers for what *is* in it. This volume will be used as a basic reference for many years, and its possession is imperative for any low temperature physicist.

Sonics. By Theodor F. Hueter and Richard H. Bolt. 456 pp. John Wiley and Sons, Inc., New York, 1955. $10.00. *Reviewed by R. B. Lindsay, Brown University.*

It is a well-known characteristic of our age that progress in technology goes hand in hand with fundamental research. Until fairly recently this has been exemplified in acoustics mainly by the tremendous improvements made in the production, transmission and reception of sound signals, e.g., speech and music, as well as the greatly increased knowledge of the acoustic properties of materials and their proper disposal for use in architectural acoustics. The past two decades, however, have witnessed the blossoming of a vast host of new types of acoustical applications, of which the processing of suspensions in gases and liquids, the testing and cleaning of solids, and the analysis of the physical properties of fluids are only a few typical examples. The authors of the present volume have decided to coin a new word, "sonics", to include such aspects of acoustics. They define it as encompassing the "analysis, testing and processing of materials and products by the use of mechanical vibratory energy". It is their feeling that the technologists who employ sound in this way can profit from a unified exposition of the principles of acoustics, covering all readily obtainable frequencies and intensities, and their application to sonic techniques and equipment. They have succeeded admirably in their design.

When physicists write for technologists they have two common dangers to guard against. They may be too easily tempted to produce an exposition of rigorous, fundamental theory which is difficult for the practical user to understand and hence of very little use to him. On the other hand they may prepare what is little more than a handbook or compendium of formulas and recipes which the practical man is apt to employ without due judgment and discrimination and therefore often gets himself into much trouble. It is a pleasure to report that the authors of *Sonics* have not succumbed to either temptation. Their survey of general principles puts the stress on physical meaning and intuition, where it rightly belongs in a book of this kind, and instead of merely cataloging the vast list of special devices now available they provide typical and well-chosen illustrations for each technique discussed. The summary of theory, indeed, by focusing attention on gaps and weak spots in our knowledge provides a useful stimulus to further basic research. Hence the volume has much of value to offer the acoustical research physicist as well as the technologist.

The first three chapters discuss the fundamental acoustical principles. Chapters 4 and 5 are devoted to a thorough treatment of piezoelectric and magnetostrictive transducers respectively. Sonic processing, both methods and devices, provides the theme of chapters 6 and 7, while chapter 8 takes up sonic testing and analysis. There is a very valuable appendix on acoustic relaxation mechanisms in fluids.

The book is copiously illustrated with excellent diagrams as well as clear pictures of sonic equipment. One of the useful special features is the presence of a number of tables, each summarizing the various aspects of a given phenomenon. Thus the one on radiation pressure shows at a glance the expressions for this quantity for all types of commonly encountered physical situations. The technologist will particularly appreciate the large number of clear charts and the abundance of useful numerical data.

All who are interested in the applications of acoustics, both to the study of the properties of matter as well as to the modern applications of sound radiation in technology, will wish to have this volume readily available.

Molecular Vibrations. By E. Bright Wilson, Jr., J. C. Decius, and Paul C. Cross. 388 pp. McGraw-Hill Book Company, Inc., New York, 1955. $8.50. *Reviewed by D. E. Mann, National Bureau of Standards.*

Over the last 25 years, the vibrational spectra of a great variety of molecules have been investigated and a vast fund of experimental data accumulated. Although the basic theoretical methods and tools have been available for some time, detailed analyses have been carried through for only a small fraction of the molecules for which data are at hand. At least in part, this is because

the effort required for a complete analysis is frequently far greater than the results warrant or circumstances permit. On the other hand, it is probably also true that some spectroscopists may have been deterred by their unfamiliarity with the language of group theory and matrix algebra, in terms of which much of molecular vibration theory is expressed. Moreover, much of the necessary formalism has been available heretofore only in a few widely scattered journal articles. This book presents a thorough, consistent, and masterfully lucid exposition of the essential elements of the theory and will probably do much to encourage further interest in detailed vibrational analyses. The reader is led carefully and gradually through the main features of the theory and its methods, beginning with the simplest and proceeding to its most general and powerful formulation. Symmetry properties and application of group theory to molecular vibrations are gone into detail and with great clarity of presentation. The methods for setting up and solving secular equation are also lucidly explained, and finally applied to the benzene molecule as a specific example. The book will be welcomed both as a text and as a reference work.

Physicochemical Calculations. By E. A. Guggenheim and J. E. Prue. 491 pp. (North-Holland Publishing Co., Netherlands) Interscience Publishers, Inc., New York, 1955. $7.00. *Reviewed by George Zimmerman, Bryn Mawr College.*

This is a carefully prepared collection of 171 calculations based entirely on papers from the chemical and physical literature. Each calculation is worked out numerically in great detail, and is, on the whole, well-presented. The authors have succeeded quite well in making the selection as diverse and representative as possible and such that the book should be of considerable interest to physicists as well as chemists. Certainly in the last 30 years physical chemistry (judging its content by the average output of those in the field) has expanded greatly and now includes the field of chemical physics, as defined, say, by the *Journal of Chemical Physics*. In Guggenheim and Prue's book ⅓ to ½ of the problems could be classified safely as chemical physics, and only about ⅓ deal directly with chemical reactions. This distribution seems to be characteristic of present-day physical chemistry in spite of the fact that chemical reactions should probably still form the unifying basis of chemistry. In this book the selection of topics would, perhaps, better typify modern physical chemistry if the fields of experimental and theoretical molecular structure, radiation (including photo-) chemistry, and high polymers were better represented; also, considering that the field of nuclear physics *is* included (5 examples), it is inadequately treated.

The very laudable aim of the book is to provide instruction through practice in typical research calculations starting with raw experimental data—"problem working" in its most advanced form. In this country this book would be applicable both to undergraduate courses in physical chemistry and chemical physics and to first year graduate training in the same fields. It does not seem so well designed for self study, since the main value to students (and beginning instructors) certainly lies in carrying through such calculations by themselves and in their own ways, rather than in following the authors' often somewhat unnecessarily detailed algebra and arithmetic. There is also no attempt made to provide textbook references for the underlying theories; usually the formulas needed are used without comment.

I would be happier to see more emphasis on experimental uncertainties and errors, e.g., to see more use made of the theory of errors in treating data and results. It is gratifying to see the rather careful attention to units and dimensions and the frequent treatment of the same quantity (or system) from a number of alternative and often independent points of view. An excellent idea was to include a few cases where the results of a calculation clearly show that the underlying assumptions were inadequate!

On the whole, the authors are to be congratulated for what will no doubt prove a valuable and useful book.

Servomechanisms and Regulating System Design. Volume II. By Harold Chestnut and Robert W. Mayer. 384 pp. John Wiley and Sons, Inc., New York, 1955. $8.50. *Reviewed by T. Teichmann, Missile Systems Division, Lockheed Aircraft Corporation.*

This book is a sequel to a previous volume of the same name by the same authors, and is devoted in large part to describing the practical implementation of the basic principles set forth in this earlier work, and in fact in most introductory books on servomechanism design.

The book opens with a discussion of measurement techniques (open loop, closed loop, frequency and transient response, etc.) including a brief summary of the basic formulae of servo theory. The next chapter (II) deals with the influence of input characteristics on design, and treats the notion of equivalent sinusoidal inputs, and also noise errors and their effect on system optimization. In this connection a tracking loop is considered in some detail. The following chapters (III, IV, V, VI) concern respectively power requirements of control elements, networks for desired attenuation frequency characteristics (including an extensive table), amplifier design, and ac servomechanism operation. The final three chapters consider the application of nonlinear elements. Chapter VII describes the linearization of nonlinear elements for small departures from a fixed operating condition, while Chapter VIII discusses the large departure case. Particular attention is paid to problems of saturation backlash and hysteresis. Stability is discussed at length with reference to the linear picture, and many curves are presented, but there is only a very brief semi-qualitative description of the phase plane method. Chapter IX illustrates applications of nonlinear elements to servo design.